REMARKS

I. Status of the claims

Claims 1-23 are pending. Claims 1, 6 and 13 have been amended to correct a typographic error appearing in the acronym "NMR." Claim 12 and the corresponding section of the specification have been amended to conform the subject matter of these two sections. New claims 21-23 relate to the density of the thermoplastic resin composition. Support for new claims 21-23 may be found on page 4, lines 4-15 of the specification. No new matter has been introduced through this amendment and no substantive change in the scope of the claims has occurred as a result of this amendment.

II. Objection to claims 12 and 19

The Examiner has objected to claim 12 as containing a misspelling of the term "louver." However, the recited term "lower" has not been misspelled and is accurate as recited. The term "lower," when used in the context of this claim, refers to the specific areas of the automotive interior where the claimed molded thermoplastic may be used. One skilled in the art would be familiar with these terms and would be able to identify the recited locations on an automotive interior.

The Examiner has objected to claim 19 regarding the term "laminate molding." This term is described in the specification on page 8, lines 25-28. Per the Examiner's request, Applicants provide the following discussion of the term "laminate molding" as understood by those skilled in the art:

> Laminate molding is a broad term that relates to a process of molding an article wherein one or more additional layers, often in the form of a foam-plus-adhesive layer, are applied to a rigid base material. Laminate molding is used in numerous industries (flooring, automotive, construction, etc.) and in a wide variety of processes and material combinations. In the automotive industry, for example, laminate molding may be used in a two-step process where the rigid substrate is first processed via injection molding and then processed with the additional layer via thermoforming. In another example, laminate molding involves injecting the rigid base material behind the additional layer at low-pressure conditions via injection molding.

Laminate molding is well-known to those in the art, as illustrated by the following link to a recent textbook on specialized molding techniques. Laminate molding is referenced in the

summary of this book. See http://www.chemtec.org/books/rap/rap_93.html. A copy of this web page has also been provided for the Examiner's convenience.

III. Rejection under 35 U.S.C. § 103(a)

The Examiner has rejected claims 1-20 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,087,429 ("Yamamoto") in view of U.S. Patent No. 4,504,617 ("Yui"). The Examiner states that Yamamoto teaches the following three-component composition: Component A, containing 50-80% by weight of a crystalline propylene/ethylene block copolymer wherein the ethylene content is 1-15% and the MFR is 10-100; Component B, containing 5-40% by weight of an ethylene α-olefin (of 4-18 carbon atoms) polymer wherein the MFR is 0.01-7 and the density is 0.850-0.890; and Component C, containing 1-30% talc having a particle size of 0.1-5 microns. The Examiner acknowledges that Yamamoto does not teach a composition containing a crystalline propylene/ethylene block copolymer in the range of 85-90% by weight. To cure this deficiency, the Examiner combines the teaching of Yamamoto with Yui, which, according to the Examiner, teaches a composition containing 25-90% by weight crystalline copolymer of propylene with α-olefin (which can be ethylene) that is blended with synthetic rubber and has a talc filler.

In the Office Action, the Examiner states that "[t]he difference between the present invention and the prior art of Yamamoto is just a slightly higher amount of propylene/ethylene copolymer." Office Action, page 5. While Yamamoto clearly does not teach a propylene/ethylene copolymer in the range recited in Applicants' claimed invention, the differences between Applicants' invention and Yamamoto are more evident after comparing the ingredients and the properties of the components of the compositions.

The propylene resin composition of Yamamoto contains a crystalline propylene-ethylene block copolymer, Component A; an ethylene-α-olefin copolymer, Component B; and talc, Component C. Yamamoto sets out specific parameters specifying the properties of these components. Applicants use the same parameters in claiming the thermoplastic resin composition. These parameters include: the weight% of a crystalline propylene-ethylene block copolymer; the melt flow rate of the copolymer; the weight% ethylene in the copolymer; the weight% of an ethylene-α-olefin rubber; the α-olefin comonomer of the rubber; the melt flow

rate of the rubber; the density of the rubber; the weight% of talc; and the average diameter of the talc.

Column 2, lines 23-33 in Yamamoto discloses the range of values for each parameter specifying the properties of Components A, B and C in Yamamoto's propylene resin composition. Yamamoto also reports these parameters for each of its 15 examples. See Yamamoto, Tables 1 and 3. Reviewing Tables 1 and 3 of Yamamoto for the nine parameters, it becomes clear that Yamamoto's actual examples do not meet the claimed ranges of Applicants' invention. In particular, in one Yamamoto example, only 3 out of 9 parameters fall within Applicants' claimed invention (Example 9); in five examples, only 2 out of 9 parameters fall within Applicants' claimed invention (Examples 4, 10-12 and 14); in seven examples, only 1 out of 9 parameters fall within Applicants' claimed invention (Examples 1-3, 5, 7, 8 and 13); and in one example, 0 out of 9 parameters fall within Applicants' claimed invention (Example 15). Thus, no examples run in accordance with the Yamamoto invention contain more than 3 out of 9 parameters overlapping with Applicants' claimed invention. To better show the difference between the broad teachings of Yamamoto, Applicants have prepared the following table to compare Yamamoto's closest example, Example 9, with the claimed invention.

Resin Composition	Yamamto's Disclosure Col.2, lines 22-33	Yamamoto's Example 9	Applicants' claim 1 (broadest claimed invention)
% component A (wt.%)	50 - 80%	60	85-90
MFR of component A (g/10 min.)	10 – 100	30	20-30
ethylene content of component A (wt. %)	1 - 15	10	2.2-4.2
% component B (wt.%)	5 - 40	30	2-8
MFR of component B (g/10 min.)	0.01 - 7	1.4	5-10
Density of component B (g/cc)	0.850 – 0.890	0.863	0.860-0.865
Monomer of α-olefin in component B	1-butene and others	1-butene	butene
% component C (wt.%)	1-30	10	2-8
average diameter of component C (μm)	0.1 - 5	3.8	1-2

While it is true that Yamamoto discloses ranges for several parameters which overlap or encompass Applicants' claimed invention, Yamamoto does not teach or suggest the specific combination of parameters in Applicants' claimed thermoplastic resin composition. Nor does Yamamoto teach or suggest the advantageous properties which flow from Applicants' combination of parameters. Yamamoto's Example 9, which is included in the above table, is the closest example in Yamamoto to Applicants' claimed thermoplastic resin composition. Example 9, however, has only 3 out of 9 parameters that overlap with Applicants' claimed invention.

The differences shown in the above chart are even more evident when analyzed in view of Applicants' comparative examples. For instance, Example 9 of Yamamoto has an melt flow ratio for the rubber component (component B) measured at 1.4 g/10 minutes. In contrast, in Applicants' claimed invention, the recited melt flow ratio of the rubber ranges from 5 to 10 g/10 minutes. Comparative Example 6 demonstrates how the difference between a melt flow ratio of 1 and a melt flow ratio of 5 can affect the rigidity of the final composition. In Comparative Example 6, a composition was prepared that contained all the components and properties of the claimed invention within the recited ranges of the claimed invention, except for the melt flow ratio of the rubber. Instead of using a rubber with a melt flow ratio ranging from 5-10, a rubber with a melt flow ratio of 1 g/10 minutes was used--a melt flow ratio very similar to that of the rubber used in Example 9 of Yamamoto (1.4). Applicants found that using a rubber with a melt flow ratio of 1 g/10 minutes produced a composition with inadequate rigidity, as evidenced by the composition's inability to withstand the Dupont impact test. Thus, changing the melt flow ratio from 5 (within Applicants' claimed range of 5-10) to 1 (outside Applicants' claimed range of 5-10) had considerable impact on the properties of the final composition.

Applicants' Comparative Example 11 illustrates a similar point with regard to the average diameter of talc, component C. In Comparative Example 11, a composition was prepared that contained all the components and properties of the claimed invention, within the recited ranges of the claimed invention, except for the average diameter of the talc. Instead of using talc having a particle size of 1.5 microns (within Applicants' claimed range of 1-2 micron), talc with an average diameter of 3 microns was used. As shown by Comparative Example 11, Applicants found that using talc with an average diameter of 3 microns produced a composition with

inadequate rigidity when analyzed using the Dupont impact test. It is worth noting that every example in Yamamoto uses talc having an average diameter of 3.8 microns, a figure outside of the range recited in Applicants' claimed invention and even greater than the diameter of talc used in Comparative Example 11. It can therefore be expected that the talc used in Yamamoto will also exhibit insufficient rigidity.

The examples in Yamamoto demonstrate that the Yamamoto invention, while broadly disclosed in the specification, would not have rendered Applicants' claimed invention obvious to one of ordinary skill in the art. The closest example in Yamamoto to Applicants' claimed invention appears to be Yamamoto's Example 9. However, as shown by the chart depicted above, a considerable majority of the properties of the Example 9 composition are significantly outside the ranges recited in Applicants' claimed invention. Applicants' comparative examples additionally illustrate how small changes to the properties of the composition, such as melt flow ratio of the rubber component and average particle diameter of the talc component, affect the rigidity of the final composition. The unique combination of parameters in Applicants' claimed invention are not taught or suggested by Yamamoto. Nor would Yamamoto have suggested the superior rigidity achieved by the claimed combination.

Therefore, taking the Yamamoto disclosure as a whole in view of Applicants' claimed invention and comparative examples, one skilled in the art would not be motivated to select the specific ranges recited in Applicants' claimed invention for each property of the composition. The broad disclosure of the Yamamoto invention does not provide one skilled in the art with sufficient guidance to select the specific ranges claimed by Applicants. Moreover, the comparative examples of Applicants' specification illustrate that slight deviations outside Applicants' recited ranges often produce undesirable features in the final product, such as insufficient rigidity. One skilled in the art would not have the motivation in Yamamoto to select Applicants' claimed ranges, and, if selected, would not have the expectation that the selected ranges would successfully produce a composition exhibiting the desired characteristics of Applicants' claimed composition. See MPEP § 2144.05 and *In re Woodruff*, 16 U.S.P.Q.2d 1934 (Fed. Cir. 1990), cited therein.

Yui, the secondary reference relied upon by the Examiner, fails to cure Yamamoto's shortcomings. Yui relates to a propylene polymer composition containing (a) crystalline

polypropylene, which may be blended with a synthetic rubber, and (b) an inorganic filler, such as talc. See col. 1, line 55 to col. 2, line 15. When describing the synthetic rubber, Yui teaches that the rubber may be ethylene-propylene copolymer rubbers, styrene-butadiene copolymer rubbers and hydrogenated products thereof, isoprene rubbers, and isoprene-isobutylene rubbers. See col. 2, lines 58-63. The copy of the Yui reference provided with the Office Action contains an underlined section of this passage describing the ethylene-propylene copolymer rubbers. However, Applicants' claimed invention recites an ethylene-*butene* rubber, not an ethylene-*propylene* copolymer rubber, as suggested by Yui. In fact, Yui does not teach or suggest anywhere in its disclosure that the synthetic rubber may be an ethylene-butene rubber.

Furthermore, Yui provides no guidance to one skilled in the art as to what properties the disclosed rubber should exhibit. Properties of the rubber such as melt flow ratio and density seem unimportant as features of the Yui invention. However, Applicants have shown that when the melt flow ratio of the rubber is too high (see Comparative Example 7) or too low (see Comparative Example 6) the resulting composition exhibits insufficient rigidity. Likewise, Applicants have shown that when the density of the rubber is too high (see Comparative Example 8) or when different rubber compositions are used (see Comparative Examples 9 and 10), the resulting compositions also exhibit insufficient rigidity. Comparative Examples 6-10 each failed the Dupont Impact test because of these factors. Accordingly, Yui, which relates to a non-ethylene-butene rubber with an unknown melt flow ratio or density, does not teach or suggest Applicants' claimed invention to one skilled in the art.

Neither Yamamoto nor Yui, nor the combination of these two references, teach or suggest Applicants' claimed invention. The references fail to appreciate the elements of the composition, the specific portions of the components, and the properties exhibited by each component, all of which are recited in Applicants' claimed invention. The comparative examples set forth in the specification further illustrate the inventive features of the claimed composition and further distinguish the cited art from the claimed invention.

There is simply no motivation for one skilled in the art, in view of the cited art, to select the components in specific portions having the claimed properties in the claimed ranges, as in Applicants' invention. Without this requisite motivation, Applicants' claimed invention is not

obvious in view of the cited prior art, and Applicants' respectfully request that the Examiner withdraw this § 103(a) rejection.

IV. <u>Conclusion</u>

Applicants respectfully request reconsideration of this application in view of the above amendment and remarks.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned, "<u>Version with markings to show changes made</u>."

Except for issue fees payable under 37 C.F.R. §1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 50-0310. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. §1.136(a)(3).

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the specification:

Page 9, lines 14-18:

The thermoplastic resin composition may be molded into to any shape or form. Preferably, it is molded into parts that may be used in the interior of an automobile, such as a console, steering column cover, driver lower cover, column cover lower, column cover upper, side cover right, side cover left, center lower cover, center lower garnish, defroster duct, glove box, duct outlet, and tailgate lower.

In the claims:

Please amend claims 1, 6, 12 and 13 as follows:

1. (amended) A thermoplastic resin composition, comprising:
    a. about 85 to about 95 weight% of a crystalline propylene ethylene block copolymer or of a combination of a crystalline propylene ethylene block copolymer and a polypropylene homoploymer, wherein
        i. said crystalline propylene ethylene block copolymer or said combination has a melt flow rate, measured at 230° C under 2.16-kg load, ranging from about 20 to about 30 g/10 minutes,
        ii. the wt% of ethylene in said crystalline propylene ethylene block copolymer or said combination ranges from about 2.2 to about 4.2 wt%; and
        iii. said propylene homopolymer has an isotactic pentad fraction, measured by ^{13}C-[MNR] NMR, greater than or equal to about 94%
    b. about 2 to about 8 weight% of an ethylene butene rubber, wherein said ethylene butene rubber has
        i. a melt flow rate, measured at 230° C under 2.16-kg load, ranging from about 5 to about 10 g/10 minutes, and
        ii. a density ranging from about 0.860 to about 0.865 g/cc; and

c. about 2 to about 8 weight% of talc that has an average diameter ranging from about 1 to about 2 μm.

6. A molded thermoplastic article, comprising:

a. about 85 to about 95 weight% of a crystalline propylene ethylene block copolymer or of a combination of a crystalline propylene ethylene block copolymer and a polypropylene homoploymer, wherein

i. said crystalline propylene ethylene block copolymer or said combination has a melt flow rate, measured at 230° C under 2.16-kg load, ranging from about 20 to about 30 g/10 minutes,

ii. the wt% of ethylene in said crystalline propylene ethylene block copolymer or said combination ranges from about 2.2 to about 4.2 wt%; and

iii. said propylene homopolymer has an isotactic pentad fraction, measured by ^{13}C-[MNR] NMR, greater than or equal to about 94%

b. about 2 to about 8 weight% of an ethylene butene rubber, wherein said ethylene butene rubber has

i. a melt flow rate, measured at 230° C under 2.16-kg load, ranging from about 5 to about 10 g/10 minutes, and

ii. a density ranging from about 0.860 to about 0.865 g/cc; and

c. about 2 to about 8 weight% of talc that has an average diameter ranging from about 1 to about 2 μm.

12. The molded thermoplastic article of claim 11, wherein said automotive interior part is selected from the group consisting of: tailgate lower, console, steering column cover, driver lower cover, column cover lower, column cover upper, side cover right, side cover left, center lower cover, center lower garnish, defroster duct, glove box, and duct outlet.

13. A process of preparing a molded thermoplastic resin composition, comprising:

a. providing a thermoplastic resin composition comprising:

i. about 85 to about 95 weight% of a crystalline propylene ethylene block copolymer or of a combination of a crystalline propylene ethylene block copolymer and a polypropylene homoploymer, wherein

(a) said crystalline propylene ethylene block copolymer or said combination has a melt flow rate, measured at 230° C under 2.16-kg load, ranging from about 20 to about 30 g/10 minutes,

(b) the wt% of ethylene in said crystalline propylene ethylene block copolymer or said combination ranges from about 2.2 to about 4.2 wt%; and

(c) said propylene homopolymer has an isotactic pentad fraction, measured by ^{13}C-[MNR] NMR, greater than or equal to about 94%

ii. about 2 to about 8 weight% of an ethylene butene rubber, wherein said ethylene butene rubber has

(a) a melt flow rate, measured at 230° C under 2.16-kg load, ranging from about 5 to about 10 g/10 minutes, and

(b) a density ranging from about 0.860 to about 0.865 g/cc; and

iii. about 2 to about 8 weight% of talc that has an average diameter ranging from about 1 to about 2 μm.

b. molding said thermoplastic resin composition into a molded thermoplastic resin.

Specialized Molding Techniques - Application, Design, Materials and Processing

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ISBN 7-884207-91-X
Published: 2001
Pages: 317
Figures: 207
Tables: 45

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Summary:

A surge of new molding technologies is transforming plastics processing and material forms to the highly efficient, integrated manufacturing that will set industry standards in the early years of this century. Many of these emerging material-process technologies discussed in this book include: gas-assisted injection molding, fusible core injection molding, low pressure injection molding (including laminate molding and liquid-gas assist molding), advanced blow molding, thermoplastic sheet composite processing, reactive liquid composite molding, microcellular plastics, lamellar injection molding, and multimaterial, multiprocess technology, coinjection, in-mold decoration, encapsulation, stack molding, micro-injection molding, fusible core, vibration-assisted, injection molding extrusion, surface replication and direct compounding. The main emphasis is given to thin wall molding, gas-assist molding, and vacuum assisted resin transfer molding. To put these new technologies in a context and to accentuate opportunities, the relations among these technologies are analyzed in terms of

Products: auto parts (e.g. bumpers, trim, keyless entry module, blower switch housing), business machines chassis, pallets, furniture, handles, television housings, covers, golf club shafts, connectors, notebook casing, switches, sensors, antennas, sockets, lighting, cellular phone housing, submicron parts, and medical devices.
Materials: composition, resin consideration, blends, structure (skin/core), shrinkage, viscosity, weld line strength, structural properties, morphology, reinforcement, surface roughness
Processing: macroscopic structure, size and shape, typical

problems and their solutions, flow length, injection pressure prediction, process simulation, processing parameters, tooling issues, rheology, rheokinetics, flow equations, flow simulation, no-slip boundary conditions, pressure loss, surface appearance, manufacturing cost, leakage modelling, set-up criteria, optimization of molding parameters non-return valve aaplications.

Geometry: function (enclosure/support) and complexity (symmetric/three-dimensional), molding window, filling of complex part, design optimization, x-ray tomography, image reconstruction, acoustic imaging, warpage calculation, simulation and calculation, flow channels, and tight tolerance. Review of manufacturers, licences, required investment in equipment, and cost benefits expected in return.

This is in addition to evaluation of hardware, processing parameters, problems, and results of application of these processes. The examples of some other processes involved include: photoimaging, in-mold circuit definition, two-shot, one-shot, two-cavity shuttle design, valve gate technology, low pressure injection molding, in-mold decoration, plating, in-mold assembly, sandwich molding, and large part molding.

About the Authors:

Hans-Peter Heim studied engineering and business administration at the University of Paderborn in Germany. He completed his diploma thesis in 1996 at an automotive supplier company in Italy. Following this, he carried out different projects on quality assurance and quality improvement in plastics processing at this same company. Since 1997 he has worked in the field of gas assisted injection molding, quality improvement and quality assurance in Prof. Dr.-Ing. H. Potente's group at the KTP Institute of Plastics Engineering in Paderborn. He has been chief engineer at the KTP since 1999. He completed his Ph.D. thesis on gas-assisted injection molding in March 2001.

Professor Dr.-Ing. Helmut Potente gained his doctorate at the IKV Institute of Plastics Processing at Aachen University of Technology. From 1971 to 1974 he was head of the Plastics Process Engineering Laboratory at Westfälische Metallindustrie KG Hueck & Co. in Lippstadt/Germany. In 1974 he was appointed an academic officer and Professor of Joining, Forming and Refining Technology for Plastics at Aachen University of Technology. Since 1980 he has held the Chair of Plastics Engineering at the University of Paderborn and been Head of the Institute of Plastics Processing.